MAKE YOUR GLOBAL MARKET EASY

INTRODUCTION TO NGSI-LD API

Benoit ORIHUELA
- Manipulate a Graph-based information model
  - Core concepts include Entities and Relationships
  - Entities can have Properties and Relationships
  - Relationships can have Properties and Relationships
  - Properties can have Properties and Relationships
ENTITIES, PROPERTIES AND RELATIONSHIPS ...

Credits: ETSI - Lindsay Frost
... LINKED TOGETHER VIA CONTEXTUAL INFORMATION ...

urn:ngsi-ld:
Vehicle: A4567

brandName
“Mercedes”

observedAt
2017-07-29T12:00:00Z

location
[8.672, 49.398]

urn:ngsi-ld:
LegalEntity
urn:ngsi-ld:
StreetFurniture

providerBy
Org:Officer123

inAccident

hasAttached

urn:ngsi-ld:
SmartLamppost:
Downtown1

location
[8.672, 49.398]

accuracy
5%

trafficFluidity
0.9

urn:ngsi-ld:
Sensor:
Cam1

Entity Type
Entity Instance
Relationship
Property
Value

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... TO ULTIMATELY FORM A KNOWLEDGE GRAPH
SCOPE: COMMON VOCABULARY

- Referencing defined vocabularies/ontologies
  - All terms are unambiguously defined
  - Allows users to reference their familiar information definitions
  - Facilitate sharing of information (interoperability)
RELATION TO ONTOLOGIES

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GOALS

- Allow for exchange of information between systems
- Keep context information and relationships between data
- Be as simple as possible
- Easy to tackle for developers 😎
TECHNICAL CONSIDERATIONS

- A REST API
  - Use standard HTTP verbs: GET, POST, PATCH, ...
  - Use REST-friendly URLs
- JSON-LD (W3C standard) as a data exchange format
**Coverage (1/2)**

- Context information provision
  - Create an entity (POST)
  - Add a relation between two entities (POST)
  - Update the value of a property (PATCH), ...

- Context information consumption
  - Query (GET)
  - Temporal Query (GET)
  - Geo Query (GET)

- Context information subscription
  - Subscribe (and be notified) to changes in context
- Context source registration
- Context source discovery
- Context source registration subscription
  - Related to distributed sources of information
An entity, technically #1

- An entity
  - Is “something” (physical or virtual)
  - Has a type (Vehicle, Sensor, ..)
  - Is uniquely identified by an Id (URI)

- An entity has zero or more attributes identified by a name
  - Property: static or dynamic characteristic of an entity
    - Can be geospatial and / or temporal
    - Can also have properties and relationships
  - Relationship: association with another linked entity (unidirectional)
    - Can also have properties and relationships
  - Build a navigable knowledge graph
AN ENTITY, TECHNICALLY #2

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AN ENTITY, TECHNICALLY #3

- Core (mandatory) properties to give context to your information:
  - location: geospatial location, encoded as GeoJSON
  - observedAt: observation timestamp, encoded as ISO8601
  - createdAt: creation timestamp (of entity, attribute)
  - modifiedAt: update timestamp (of entity, attribute)
  - unitCode: unit of measurement, encoded as mandated by UN/CEFACT
ENTITY EXAMPLE #1

```json
{
  "id": "urn:ngsi-ld:Vehicle:A4567",
  "type": "Vehicle",
  "brandName": {
    "type": "Property",
    "value": "Tesla"
  },
  "inAccident": {
    "type": "Relationship",
    "object": "urn:ngsi-ld:SmartLamppost:Downtown1",
    "observedAt": "2017-07-29T12:00:00Z",
    "providedBy": {
      "type": "Relationship",
      "object": "urn:ngsi-ld:Org:Officer123"
    },
    "location": {
      "type": "GeoProperty",
      "value": {
        "type": "Point",
        "coordinates": [8.672, 49.398]
      }
    }
  },
  "@context": [
    "https://schema.lab.fiware.org/ld/context",
    "http://uri.etsi.org/ngsi-ld/v1/ngsi-ld-core-context.jsonld"
  ]
}
```
ENTITY EXAMPLE #2

```json
{
    "id": "urn:ngsi-ld:Sensor:Cam1",
    "type": "Sensor",
    "trafficFluidity": {
        "type": "Property",
        "value": 0.9,
        "observedAt": "2019-11-22T12:00:00Z",
        "accuracy": {
            "type": "Property",
            "value": 0.05
        }
    },
    "isAttachedTo": {
        "type": "Relationship",
        "object": "urn:ngsi-ld:SmartLamppost:Downtown1"
    },
    "@context": [
        "https://schema.lab.fiware.org/ld/context",
        "http://uri.etsi.org/ngsi-ld/v1/ngsi-ld-core-context.jsonld"
    ]
}
```
- Get a vehicle by id
  - GET /entities/urn:example:Vehicle:A4567
- Get all the vehicles
  - GET /entities?type=Vehicle
- Get all the vehicles whose brand name is Tesla
  - GET /entities?type=Vehicle&q=brandName==Tesla
- Get all the vehicles parked in Downtown
  - GET /entities/type=Vehicle&q=isParked==urn:example:OffStreetParking:Downtown
**Queries #2**

- Get all the vehicles in a specific area
  - GET
    `/entities?georel=near;maxDistance==2000&geometry=point&coordinates=[-2.35, 40.78]`

- Get the temporal evolution of a Vehicle
  - GET `/temporal/entities/urn:example:Vehicle:A4567`
  - GET
    `/temporal/entities?type=Vehicle&q=attrs==speed&timerel=between&time=2019-11-18T00:00:00Z&timeEnd=2019-11-22T23:59:59Z`
- Subscribe to vehicles whose speed is above a threshold
  - POST /subscriptions with the following body

```json
{
  "type": "Subscription",
  "entities": [{
    "idPattern": ".+",
    "type": "Vehicle"
  }],
  "watchedAttributes": ["speed"],
  "q": "speed>=50",
  "geoQ": {
    "georef": "near;maxDistance==2000",
    "geometry": "Point",
    "coordinates": [-1, 100]
  }
}
```

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Special thanks to **ETSI’s ISG CIM group** and the **FIWARE foundation** for the many diagrams I have reused in this presentation!
EXTERNAL RESOURCES

- API specification: https://www.etsi.org/deliver/etsi_gs/CIM/001_099/009/01.02.01_60/gs_CI M009v010201p.pdf
- FIWARE tutorial: https://github.com/FIWARE/tutorials.Linked-Data
- FIWARE data models (https://fiware-datamodels.readthedocs.io/en/latest/):
THANK YOU ! QUESTIONS ?

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